



Saffron Drying Methods

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September, 2021

Saffron is the dried stigmas of *Crocus sativus* L., a fall-blooming perennial crop in the Iridaceae family. It is an emerging high value crop for North American growers. While it has been shown that saffron can be grown successfully in many regions of the US, the quality of this product is unknown. Saffron contains at least 28 different compounds, which affect its color and how it tastes and smells. Crocin ($C_{44}H_{64}O_{24}$), picrocrocin ($C_{16}H_{26}O_7$) and safranal ($C_{10}H_{14}O$) are the main bioactive compounds in stigmas, the concentration of which defines saffron quality. Crocin is largely responsible for the color of the final product, whereas picrocrocin and safranal concentrations influence its flavor and aroma. Saffron quality is strongly affected by the geographical origin, climate condition, type of farm management and post-harvest handling (drying, storage, etc.). Stigmas must be dried enough so they lose over 80% of their water content to obtain high quality saffron. The effect of the drying method on saffron quality has been described from several studies (Neri et al., 2021; Lopez et al., 2021; Rocchi et al., 2019). Many methods of saffron drying have been reported and the method selected depends on the end purpose for the product. If the saffron will be used as a spice, flavor is critical; whereas if it will be used medicinally, the amount of key therapeutic compounds is important. We are focusing on the culinary, rather than medicinal use of saffron. Research is needed in the future to confirm the medicinal benefits of saffron and how to prepare the product to maximize its therapeutic qualities.



Fig. 1. Dried saffron.

Three basic dehydration temperature levels are reported in the literature: high, mild or medium, and low temperature (room or air temperature). Spanish researchers tested the effect of different drying methods, using high, medium and low temperatures on their locally-grown saffron (Manuel et al., 2005). They evaluated the depth of color, bitterness, aroma and moisture content. The saffron dried at room temperature had a significant lower quality (i.e., color, flavor and aroma) and higher moisture content than samples dried at 194 °F [90 °C] and 230 °F [110 °C].

To evaluate the effect of drying temperatures on saffron quality, researchers at the North American Center for Saffron Research and Development conducted a chemical analysis on Vermont-grown saffron. Three temperature regimes were tested to dry saffron stigmas in an oven: high (~210 °F [100 °C] for 7-10 minutes), medium (~170 °F [77 °C] for 25 minutes); and low (~130 °F [55° C] for 60 minutes). **The high temperature regime generated more safranal and crocins than the other two lower temperature regimes.** The effect of the three temperature regimes on the concentration of picrocrocin was not significant. This suggests that this higher temperature is optimal for obtaining high quality saffron with a robust flavor and aroma. Saffron dehydration at a higher temperature also reduces the duration of post-harvest handling where many growers are busy with other work in

their fields, greenhouses and high tunnels. Our findings only begin to answer the question about how best to dry saffron to obtain a high-quality product and contradict findings of other past research conducted by others. Further research is needed to confirm this work under other conditions.



Fig. 2. John Padua, VT grower, separating saffron flowers and preparing stigmas for drying.

If growers use a commercial dehydrator to dry their stigmas, most do not go higher than 160 °F [71.1 °C] (Fig. 2). One more expensive professional dehydrator reached up to 194 °F [90 °C]. In contrast, many modern ovens in kitchen stoves can't be set low enough. In this case, it may be possible to keep the door open while drying to reduce the temperature around the stigmas. The trays should be placed in the center of the oven to obtain the most consistent temperature. If using this method, use an oven thermometer to monitor the temperature during drying. Though our findings indicate that saffron quality is best when stigmas are dried at a high temperature, growers have been using standard dehydrators to produce high quality saffron.

When the dehydration process is finished, dry stigmas should be allowed to cool completely to prevent condensation. The dry saffron should then be placed in an aluminum tin or glass container with a tight-fitting lid and held in the dark at room temperature. If left out in the air on a humid day, saffron will absorb moisture from the air. If not dry enough (less than 12% moisture content) the product may mold in the container, rendering it unusable. It has been reported, but not confirmed scientifically, that it is best to wait one month before using saffron, during which time the saffron flavor is enhanced.

References

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Acknowledgements. We appreciate the support for the UVM Saffron Research and Outreach Program from our grower cooperators, RocoSaffron; iSun; Univ. of VT College of Agric. & Life Science, UVM Extension System; VT Dept. of Agric. Specialty Crops Block Grant; US Dept. of Agric., USDA NIFA AFRI; HATCH Multistate Project #W4185, under award #VT-H02405MS. Opinions, findings, conclusions, or recommendations expressed herein are those of the authors and do not necessarily reflect the view of the US Dept. of Agriculture or other funding organizations.